

The invention claimed is:

1. An escapement system for orienting a plurality of fasteners, comprising:
a housing member including a first station and a second station;
a drum member operably coupled with the housing member and adapted to move a fastener from the first station to the second station;
a first seating assembly adapted to abuttingly engage the fastener at the first station and seat the fastener against a datum surface, wherein a selected one of the housing member and the drum member includes the datum surface; and
a first probe assembly separate from the first seating assembly and including a first probe member adapted to abuttingly engage the fastener and a first proximity switch operably coupled with the first probe member, wherein the first proximity switch is configured to indicate proper alignment of the fastener within the first station.
2. The escapement system of claim 1, wherein the first seating assembly includes a first crowder pin that is adapted to abut a surface of the fastener.
3. The escapement system of claim 2, wherein the first crowder pin is operably driven by a first pneumatic cylinder.
4. The escapement system of claim 2, wherein the first probe of the first probe assembly is adapted to be abuttingly received within only one aperture of the fastener.

5. The escapement system of claim 4, wherein the first probe of the first probe assembly is operably driven by a second pneumatic cylinder.
6. The escapement system of claim 1, wherein the drum member includes a circularly-shaped plate member rotatably coupled with the housing member.
7. The escapement system of claim 6, wherein the drum member is driven by a first pneumatic indexing mechanism.
8. The escapement system of claim 1, wherein the housing member includes the datum surface.
9. The escapement system of claim 1, wherein the first proximity switch of the first probe assembly includes an optical switch.
10. The escapement system of claim 1, further including:
a reorientation assembly aligned with the second station and adapted to reorient the fastener if improperly oriented as indicated by the proximity switch of the probe assembly.
11. The escapement system of claim 10, wherein the reorientation assembly includes a second drum member adapted to receive the fastener therein, and wherein the drum member is rotatable with respect to the first drum member.

12. The escapement system of claim 11, wherein the second drum is driven by a pneumatic-type rotary actuator.

13. The escapement system of claim 10, wherein the housing member further includes a third station and a forth station, and wherein the drum member is further adapted to move the fastener from the second station to the third and fourth stations; and further including:

a second seating assembly adapted to abuttingly engage the fastener at the third station and seat the fastener against the datum surface; and

a second probe assembly separate from the second seating assembly and including a second probe member adapted to abuttingly engage the fastener, and a second proximity switch in operable communication with the second probe member, wherein the second proximity switch is configured to indicate proper alignment of the fastener within the third station.

14. The escapement system of claim 13, wherein the second seating assembly includes a second crowder pin that is adapted to abut a surface of the fastener.

15. The escapement system of claim 13, wherein the second crowder pin is operably driven by a third pneumatic cylinder.

16. The escapement system of claim 12, wherein the second probe of the second probe assembly is adapted to be abuttingly received within only one aperture of the fastener.

17. The escapement system of claim 16, wherein the second probe of the second probe assembly is operably driven by a fourth pneumatic cylinder.

18. The escapement system of claim 13, further including:

a redirect assembly in operable communication with the fourth station of the housing and adapted to redirect the fastener to the first station if the fastener is improperly aligned as indicated by the second proximity switch of the second probe assembly.

19. The escapement system of claim 1, further including:

a feeder track in operable communication with the first station of housing and adapted to deliver the fastener thereto.

20. The escapement system of claim 1, wherein the second proximity switch of the second probe assembly includes an optical switch.

21. An escapement system for orienting a plurality of nuts, each nut having a first surface, a substantially planar second surface opposed across the nut from the first surface, an aperture extending between the first surface and the second surface and having a radius, a frusto conical-shaped first counter bore extending into the first surface and concentrically located with the aperture, and a cylindrically-shaped second counter bore extending into the second surface, concentrically located with the aperture, and having a radius that is greater than the radius of the aperture; the escapement comprising:

a housing member including a first station and a second station;

a drum member operably coupled with the housing member and adapted to move the nut from the first station to the second station;

a first seating assembly adapted to abut a selected one of the first counter bore and the second counter bore of the nut at the first station and seat the nut against a datum surface, wherein a selected one of the housing member and the drum member includes the datum surface; and

a first probe assembly separate from the first seating assembly and including a cylindrically-shaped first probe member having a radius that is greater than the radius of the aperture and the radius of the first counter bore, the first probe member is adapted to actuate between a retracted position and an extended position, wherein the probe member is extendable into a selected one of the first counter bore and the second counter bore not abutted by the first seating assembly, the first probe assembly further including a first proximity switch operably coupled with the first probe member, wherein the first proximity switch is adapted to register the position of the first probe member, thereby determining the orientation of the nut within the first station.

22. The escapement system of claim 21, wherein the first seating assembly includes a first crowder pin having a cone-shaped end that is adapted to the selected one of the first counter bore and the second counter bore.

23. The escapement system of claim 22, wherein the first crowder pin is operably driven by a first pneumatic cylinder that is in operable communication with the controller.

24. The escapement system of claim 23, wherein the first probe of the first probe assembly is operably driven by a second pneumatic cylinder.
25. The escapement system of claim 21, wherein the drum member includes a circularly-shaped plate member rotatably coupled with the housing member.
26. The escapement system of claim 25, wherein the drum member is driven by a first pneumatic indexing mechanism.
27. The escapement system of claim 21, wherein the housing member includes the datum surface.
28. The escapement system of claim 21, wherein the first proximity switch of the first probe assembly includes an optical switch.
29. The escapement system of claim 21, further including:
a reorientation assembly aligned with the second station and adapted to reorient the fastener if improperly oriented as indicated by the first proximity switch of the first probe assembly.
30. The escapement system of claim 29, wherein the reorientation assembly includes a second drum member adapted to receive the fastener therein, and wherein the drum member is rotatable with respect to the first drum member.

31. The escapement system of claim 30, wherein the second drum is driven by a pneumatic-type rotary actuator.

32. The escapement system of claim 29, wherein the housing member further includes a third station and a fourth station, and wherein the drum member is further adapted to move the fastener from the second station to the third and fourth stations; and further including:

a second seating assembly adapted to abut a selected one of the first counter bore and the second counter bore of the nut at the third station and seat the nut against the datum surface; and

a second probe assembly separate from the second seating assembly, and including a cylindrically-shaped second probe member having a radius that is greater than the radius of the aperture and the radius of the first counter bore, the first probe member being adapted to actuate between a retracted position and an extended position, wherein the probe member extends into a selected one of the first counter bore and the second counter bore not abutted by the second seating assembly, the second probe assembly further including a second proximity switch operably coupled with the second probe member, wherein the second proximity switch is adapted to register the position of the second probe member, thereby determining the orientation of the nut within the third station.

33. The escapement system of claim 32, wherein the second seating assembly includes a second crowder pin that is adapted to abut a surface of the fastener.

34. The escapement system of claim 32, wherein the second crowder pin is operably driven by a third pneumatic cylinder.

35. The escapement system of claim 34, wherein the second probe of the second probe assembly is operably driven by a fourth pneumatic cylinder.

36. The escapement system of claim 32, further including:

a redirect assembly in operable communication with the controller and with the fourth station of the housing and adapted to redirect the fastener to the first station if the fastener is improperly aligned as indicated by the second proximity switch of the second probe assembly.

37. The escapement system of claim 21, further including:

a feeder track in operable communication with the first station of housing and adapted to deliver the fastener thereto.

38. An escapement system for orienting a plurality of fasteners, comprising:

a housing member including a first station, a second station, a third station, and a fourth station;

a first drum member rotatably coupled with the housing member and adapted to move a fastener between the first station, the second station, the third station and the fourth station;

a first seating assembly adapted to abuttingly engage the fastener at the first station and seat the fastener against a datum surface, wherein a selected one of the housing member and the drum member includes the datum surface;

a first probe assembly separate from the first seating assembly, and including a first probe member adapted to abuttingly engage the fastener and a first proximity switch operably coupled

with the first probe, wherein the first proximity switch is configured to indicate proper alignment of the fastener within the first station;

a reorientation assembly including a second drum member that is rotatable with respect to the first drum, and is adapted to receive the fastener therein and reorient the same;

a second seating assembly adapted to abuttingly engage the fastener at the third station and seat the fastener against the datum surface;

a second probe assembly separate from the second seating assembly and including a second probe member adapted to abuttingly engage the fastener, and a second proximity switch in operable communication with the second probe, wherein the second proximity switch is configured to indicate proper alignment of the fastener within the third station; and

a redirect assembly in operable communication with the fourth station of the housing and adapted to redirect the fastener to the first station if the fastener is improperly aligned as indicated by the second proximity switch of the second probe assembly